

Appln No. 10/573,230
Amdt date December 23, 2009
Reply to Office action of June 23, 2009

REMARKS/ARGUMENTS

Claims 5-22 are pending in the application. To expedite prosecution, Applicant has amended claim 5 as indicated. As amended, claim 5 specifies that the pheromone is "an insect-derived pheromone or a synthesized pheromone having the same molecular structure as the insect derived pheromone . . ." Support for the amendment is found in ¶ 0031 of the published application. In addition, claim 5 now recites that the crystalline mineral is "selected from the group consisting of clay minerals of a multiple-chain structure type having a fibrous form, 2:1 clay minerals having a tabular form, and silicas . . ." Support for the amendment is found in ¶ 0030 of the published application.

In the Office action dated June 23, 2009, the Examiner rejected claims 5-22 as being obvious over Dodman in view of Rong et al. and Muñoz-Pallares. Applicant submits that, as amended, all claims are allowable over the cited references.

Dodman, the primary reference, discloses an animal litter preparation in which an absorbent organic or inorganic material (such as a natural or synthetic clay) is combined with an animal pheromone (e.g., a dog or cat pheromone). The composition is designed to attract an animal and then absorb liquid from the animal's waste into the absorbent material. The reference does not discuss sustained release of the pheromone from the absorbent material. To the contrary, it is important that the absorbent material absorb liquid as quickly as possible to reduce or prevent emission of odors from the animal's waste. This is exactly the opposite of the present invention, which is designed to release an insect pheromone in a sustained manner over a period of time.

Dodman also does not disclose the use of a clay that has been fired to an elevated temperature to provide a crystalline material capable of releasing a pheromone at a sustained rate over time.

Rong et al. discloses a nanocomposite material having no relation whatsoever to a crystalline mineral substrate adapted for use as a substrate for a pheromone, let alone a substrate designed to release a pheromone in a sustained manner. The nanocomposite material is a clay in combination with compounds which, *in situ*, form a polyolefin or similar polymer. The clays have been fired at an elevated temperature. Nothing in Rong et al. suggests its utility in combination with a pheromone-release composition and, indeed, Rong et al. is in a different class and subclass from both Dodman and the other reference cited by the Examiner, Muñoz-Pallares.

Muñoz-Pallares describes the use of zeolites as substrates for insect pheromones. The reference only describes zeolites and says nothing about other crystalline minerals.

The unit building blocks of zeolites are known to persons having ordinary skill in the art. In particular, zeolites contains tetrahedra of AlO_4 , and zeolites have a 3-dimensional network structure in which all four corners of the tetrahedra are shared. Pores formed in the networks can contain molecules. Such a structure is quite different from the crystalline minerals now recited in claim 5. For example, clay minerals having a multiple-chain structure type with a fibrous form, have a very different structure, as shown in Exhibit A, a printout from one page of the U.S. Geological Survey's website.

Similarly, the 2:1 clay minerals having a tabular form, also recited in claim 5, have a basic structural unit made of a layer of two inward-pointing tetrahedral sheets with a central alumina octahedral sheet sandwiched there between. Molecules can enter between the layers. This structure is quite different from that of zeolites, as shown in Exhibit B, a printout of another page from the website of the U.S. Geological Survey.

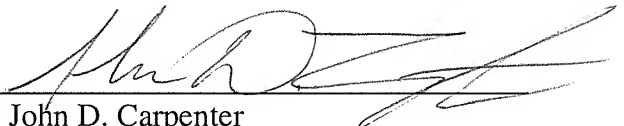
Silicas have a basic building unit of an SiO_4 tetrahedron, in which from 1 to 4 vertices (oxygen atom) of the tetrahedron are shared with other tetrahedra. Needless to say, silicas do not include aluminum atoms.

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Since the clay minerals of a multiple-chain structure type having a fibrous form, the 2:1 clay minerals having a tabular form, and silicas are structurally quite different from the typical structures of zeolites, the skilled person would have no basis to rely on the teachings of Muñoz-Pallares, and could not use that reference in combination with Dodman and/or Rong et al. to arrive at the present invention. Certainly, there is nothing in Muñoz-Pallares that would lead the skilled person to consider a calcining step in a non-zeolite crystalline mineral. Therefore, there is no basis for looking to Rong et al. And, as noted earlier, the skilled person would not consider Dodman as a reference, because it is not directed to sustained release of a pheromone.

Accordingly, Applicant respectfully submits that claim 5 and all claims dependent therefrom are allowable. A Notice of Allowance is earnestly requested.

Respectfully submitted,
CHRISTIE, PARKER & HALE, LLP

By 
John D. Carpenter
Reg. No. 34,133
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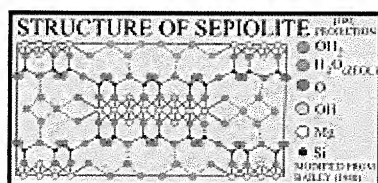
EXHIBIT A



U. S. Geological Survey Open-File Report 01-041

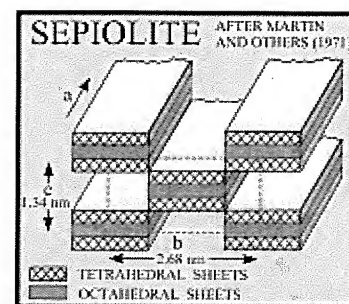
A Laboratory Manual for X-Ray Powder Diffraction

SEPIOLITE AND PALYGORSKITE

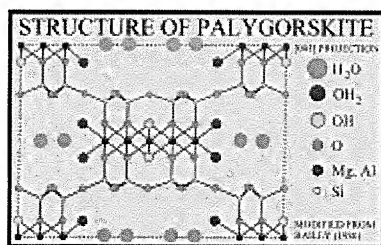


Sepiolite and palygorskite have similar fibrous or lath-like morphologies, but palygorskite exhibits more structural diversity and, although both minerals are Mg silicates, has less Mg and more Al than sepiolite (Caillere and Henin, 1961; Moore and Reynolds, 1997). The

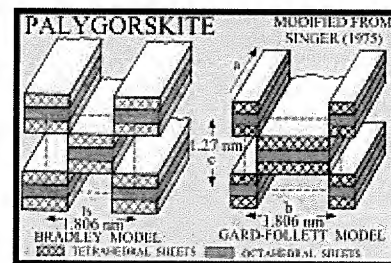
structures of both minerals are similar in that tetrahedra pointing in the same direction form 2:1 ribbons that extend in the direction of the a-axis and have an average b-axis width of three linked tetrahedral chains in sepiolite and two linked chains in palygorskite (Singer, 1989). Rectangular channels, which contain some exchangeable Ca and Mg cations and zeolitic water, lie between the ribbons, and molecules of bound water lie at the edges of the ribbons.



Both sepiolite and palygorskite require alkaline conditions and high Si and Mg activities for stability (Singer, 1989). They are also loosely associated with low latitudes and semi-arid climates. Most major deposits were originally formed in shallow seas and lakes as chemical sediments or by the reconstitution of smectites, in open oceans by the hydrothermal alteration of volcanic materials, and in calcareous soils by direct crystallization (Callen, 1984). Owing to their absorptive properties, sepiolite and palygorskite are used commercially as carriers, fillers, clarifying agents, and in used lubricant reclamation.



The fibrous nature of sepiolite and palygorskite precludes the production of oriented aggregate mounts to enhance the 001 reflection for X-ray powder diffraction (Wilson, 1987). However, strong reflections from the 011 planes yield intense peaks at 12.2 angstroms in sepiolite and at 10.5 angstroms in palygorskite. These peaks are unaffected by solvation with ethylene glycol, but change during heat treatments. After heating to 400 C, the 001 peaks of both minerals are reduced in intensity and new palygorskite peaks occur at 9.2 and 4.7 angstroms (Singer, 1989). After heating to 550 C, the original 011 palygorskite and sepiolite peaks are completely destroyed, but now new peaks for sepiolite occur at 10.4 and 8.2 angstroms.



X-ray powder diffraction patterns of oriented-aggregate mounts showing the effects of standard treatments:

- [Sepiolite](#)
- [Palygorskite](#)

Selected Bibliography for Sepiolite and Palygorskite



[Return to Clay Minerals](#)



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U.S. Department of the Interior, U.S. Geological Survey

URL: <http://pubs.usgs.gov/of/2001/of01-041/htmldocs/clays/seppaly.htm>

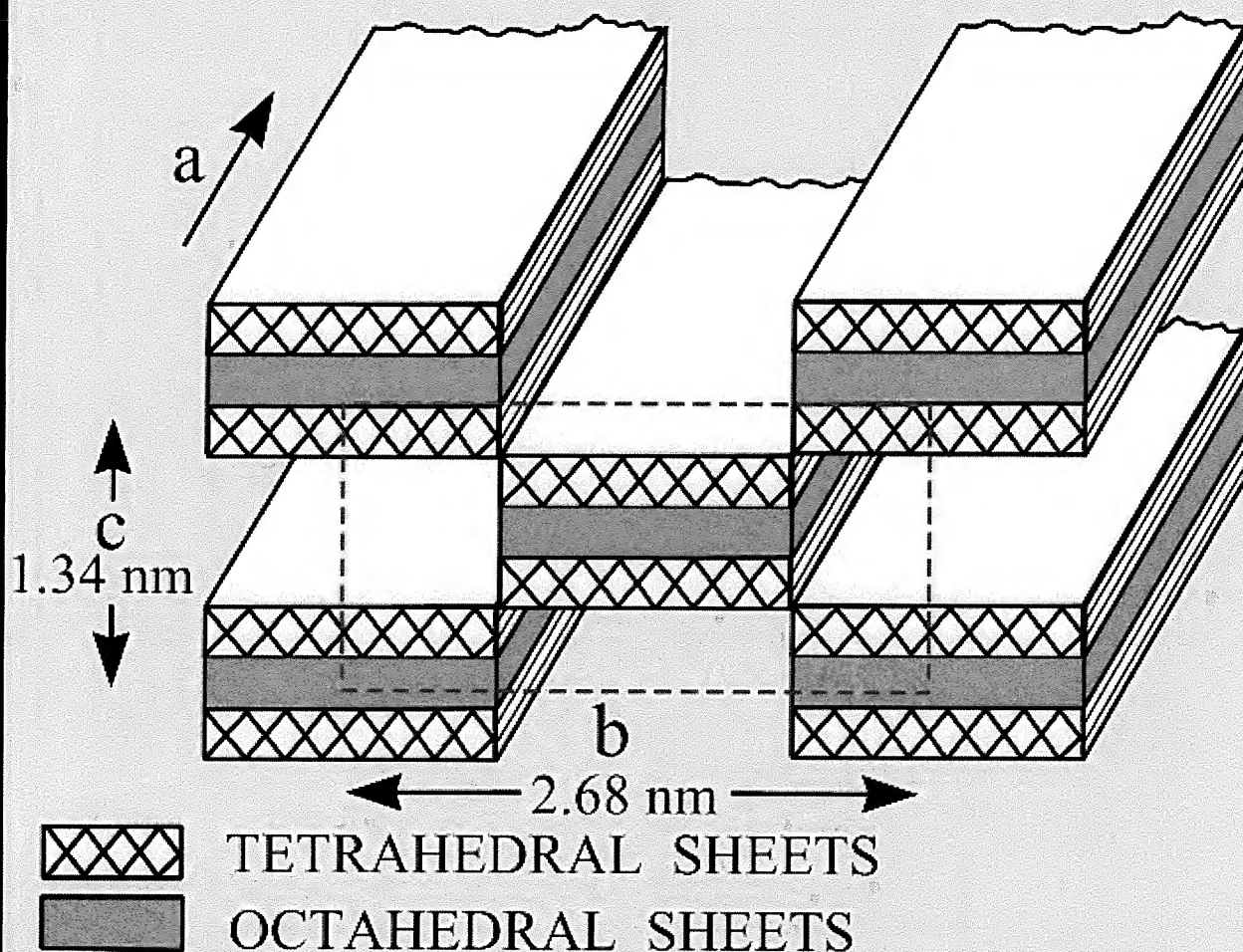
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SEPIOLITE

AFTER MARTIN
AND OTHERS (1971)



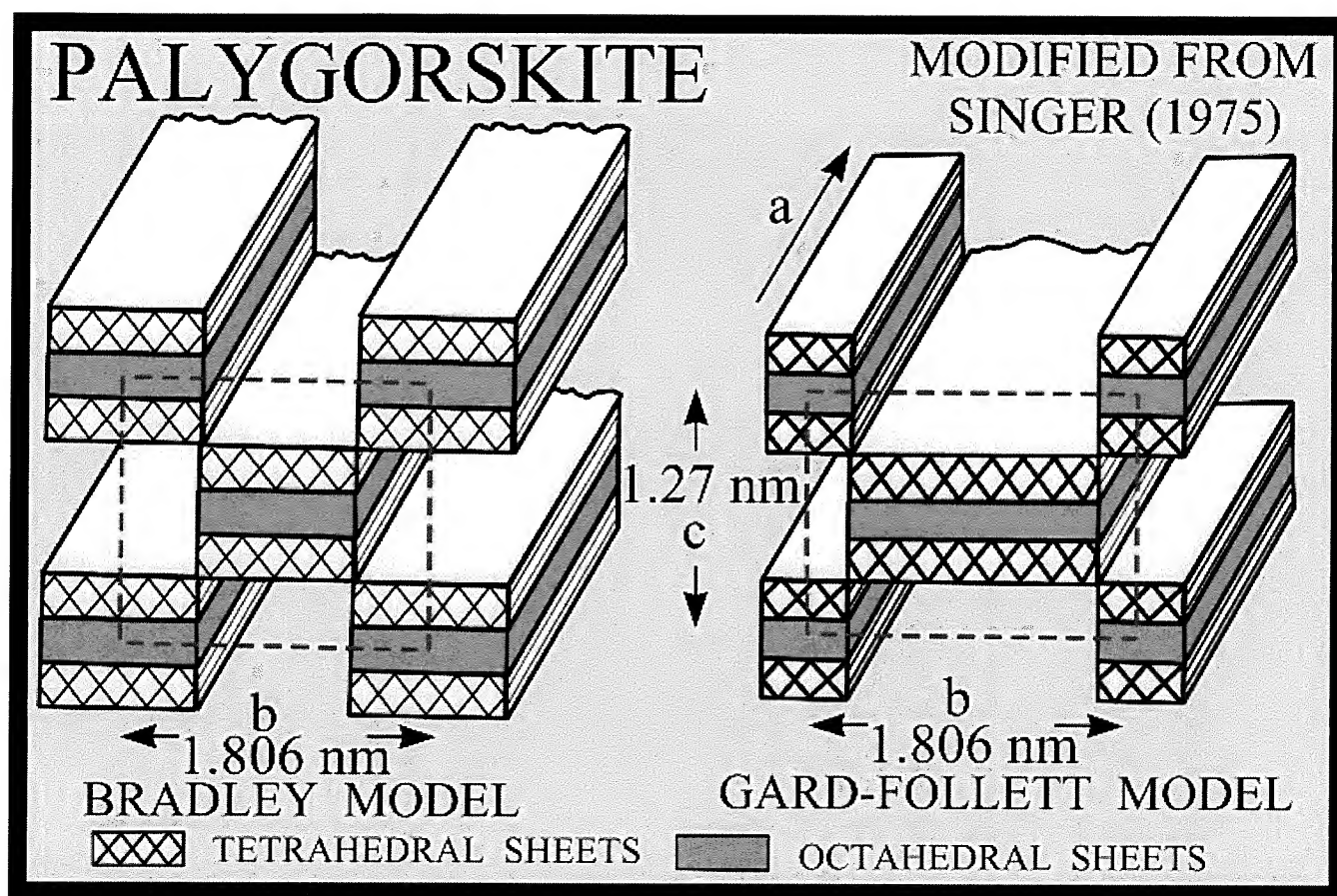
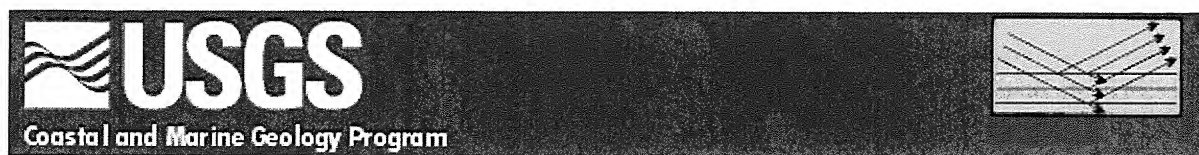


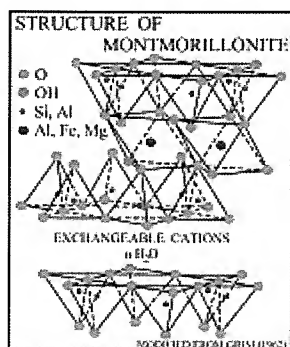
EXHIBIT B



U. S. Geological Survey Open-File Report 01-041

A Laboratory Manual for X-Ray Powder Diffraction

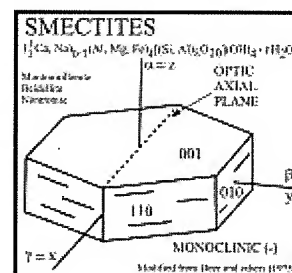
SMECTITE GROUP



Members of the smectite group include the dioctahedral minerals montmorillonite, beidellite, and nontronite, and the trioctahedral minerals hectorite (Li-rich), saponite (Mg-rich), and sauconite (Zn-rich). The basic structural unit is a layer consisting of two inward-pointing tetrahedral sheets with a central alumina octahedral sheet. The layers are continuous in the a and b directions, but the bonds between layers are weak and have excellent cleavage, allowing water and other molecules to enter between the layers causing expansion in the c direction (Grim, 1962).

Smectites commonly result from the weathering of basic rocks. Smectite formation is favored by level to gently sloping terranes that are poorly drained, mildly alkaline (such as in marine environments), and have the high Si and Mg potentials (Borchardt, 1977). Other factors that favor the formation of smectites include the availability of Ca and the paucity of K (Deer and others, 1975). Poor drainage is necessary because otherwise water can leach away ions (e.g. Mg) freed in the alteration reactions. Smectites are used in industry as fillers, carriers, absorbents, and a component in drilling fluids (Grim, 1962).

Smectites yield X-ray diffraction patterns characterized by basal reflections that vary with humidity, exposure to certain organic molecules, heat treatment, and exchangeable cations (Wilson, 1987). When saturated with ethylene glycol, the 001 reflection of most smectites will swell to about 17 angstroms (about 17.8 angstroms with glycerol); when heated to 400 C, the 001 reflection will collapse to about 10 angstroms (the exact amount of collapse is often related to the exchange cations present and to the smectite itself). Individual smectites can sometimes be differentiated by their higher-order peaks or by cation saturation. For example, dioctahedral smectites have 060 reflections at 1.50-1.52 angstroms, whereas trioctahedral smectites have 060 reflections at 1.53-1.54 angstroms; and Li saturation can be used to differentiate some montmorillonites from beidellite (Schultz, 1969).




X-ray powder diffraction patterns of oriented-aggregate mounts showing the effects of standard treatments:

- Montmorillonite API 11
- Montmorillonite API 25
- Nontronite
- Saponite

Selected Bibliography for Smectites

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U.S. Department of the Interior, U.S. Geological Survey

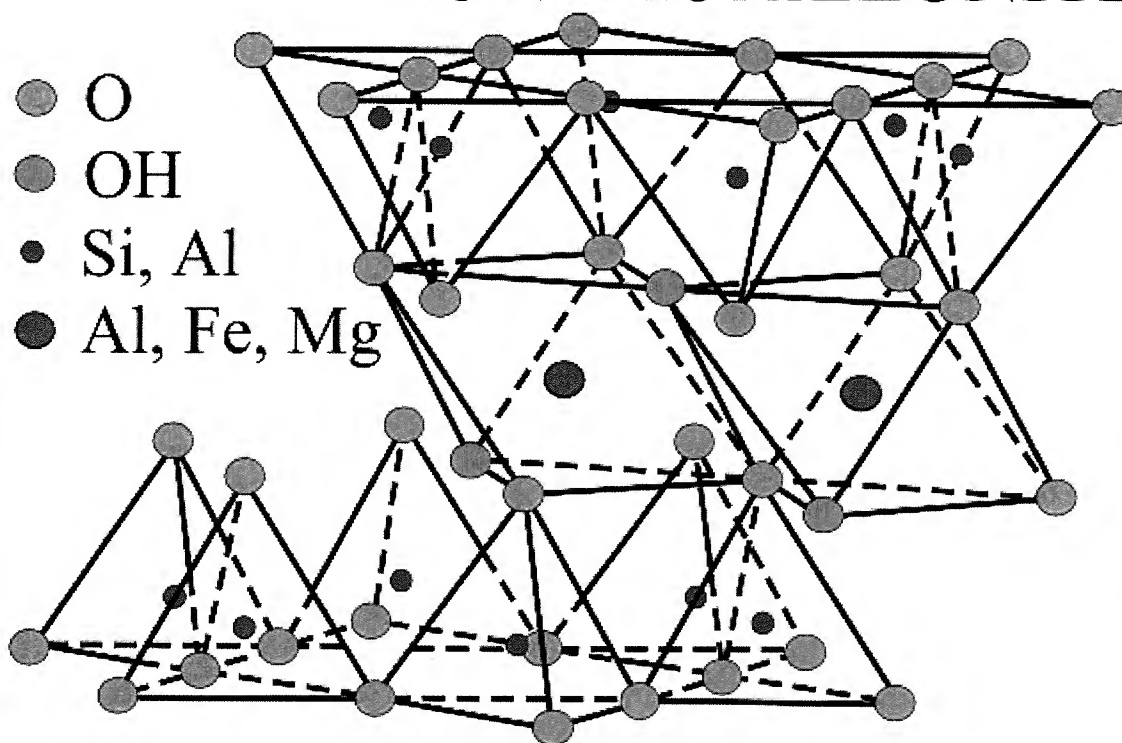
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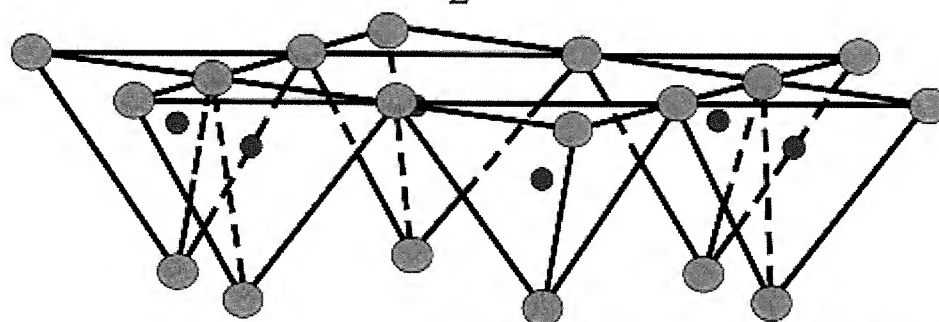
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STRUCTURE OF MONTMORILLONITE



EXCHANGEABLE CATIONS
 $n \text{ H}_2\text{O}$



MODIFIED FROM GRIM (1962)